



DAC960PG and DAC960PJ PCI to Ultra SCSI RAID Controller Installation Guide

Part Number 775012-00

© Copyright 1998 Mylex Corporation.
All Rights Reserved.

All contents of this manual are copyrighted by Mylex Corporation. The information contained herein is the exclusive property of Mylex Corporation and shall not be copied, transferred, photocopied, translated on paper, film, electronic media, or computer-readable form; or otherwise reproduced in any way, without the express written permission of Mylex Corporation.

Greetings

Thank you for purchasing a Mylex DAC960 RAID controller. Requests for technical information about this and other Mylex Corporation products should be made to your Mylex authorized reseller or Mylex marketing representative.

Please Notice

Mylex and DAC960 are registered trademarks of Mylex Corporation. Global Array Manager and GAM are trademarks of Mylex Corporation.

MS-DOS, Windows 95, and Windows NT are trademarks of Microsoft Corporation. Intel and i960 are registered trademarks of Intel Corporation. Novell and NetWare are registered trademarks of Novell, Inc. SCO, SCO UNIX, and UnixWare are registered trademarks of The Santa Cruz Operation, Ltd. Other names that are trademarks may be used herein for the purpose of identifying the products or services of their respective owners. Unless otherwise noted, companies, names and data used in examples herein are fictitious.

Our Policy

Although reasonable efforts have been made to assure the accuracy of the information contained herein, this publication could include technical inaccuracies or typographical errors. Mylex Corporation expressly disclaims liability for any error in this information, and for damages, whether direct, indirect, special, exemplary, consequential or otherwise, that may result from such error, including but not limited to loss of profits resulting from the use or misuse of the manual or information contained therein (even if Mylex Corporation has been advised of the possibility of such damages). Any questions or comments regarding this document or its contents should be addressed to Mylex Corporation at the address shown on the cover.

The following paragraph does not apply to the United Kingdom or any country where such provisions are inconsistent with local law:

MYLEX CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Some states do not allow disclaimer of express or implied warranties or the limitation or exclusion of liability for indirect, special, exemplary, incidental or consequential damages in certain transactions; therefore, this statement may not apply to you. Also, you may have other rights which vary from jurisdiction to jurisdiction.

Information in this publication is subject to change without notice and does not represent a commitment on the part of Mylex Corporation. Changes may be made periodically to the information herein; these changes will be incorporated in new editions of the publication. Mylex Corporation reserves the right to make improvements and/or changes at any time in the product(s) and/or program(s) described in this publication.

It is possible that this publication may contain reference to, or information about, Mylex Corporation products (machines and programs), programming or services that are not announced in your country. Such references or information must not be construed to mean that Mylex Corporation intends to announce, provide, or make available such Mylex products, programming, or services in your jurisdiction.

About This Manual

This installation guide covers hardware set-up and configuration procedures necessary for the installation of Mylex DAC960PG and DAC960PJ PCI to Ultra SCSI RAID controllers.

Chapter 1 describes the controllers, standard package contents, and user-supplied items necessary for installation.

Chapter 2 describes steps to be performed prior to controller installation.

Chapter 3 describes installation of the controller.

Chapter 4 describes controller start-up and the BIOS resident utilities.

Appendix A describes the Intelligent Battery Backup Unit option.

Appendix B provides the hardware and environmental specifications.

Appendix C describes error messages and how to identify problems.

Appendix D provides regulatory information and certifications.

Conventions

Throughout the manual, the following conventions are used to describe user interaction with the product:

prompt This style of type indicates screen display messages

Enter Press the key labeled “Enter” (or “Delete”, etc.)



Note

A Note is supplementary information that can have an effect on system performance



Caution

A Caution is a notification that a proscribed action has the *potential* to adversely affect equipment operation, system performance, or data integrity



WARNING

A Warning is a notification that a proscribed action will *definitely* result in equipment damage, data loss, or personal injury

Contents

Chapter 1

Introduction

Product Description	1-1
Controller Features and Functions	1-2
Operating System Support	1-2
Standard Package Contents	1-2
Hardware	1-2
Software	1-3
User-supplied Items	1-4

Chapter 2

Preinstallation Planning

SCSI Termination	2-2
SCSI Cabling	2-4
SCSI Drive Preparation	2-5
Mixing Narrow and Wide SCSI Devices	2-5

Chapter 3

Installation

Before You Begin	3-1
Connectors and Jumpers	3-2
External SCSI Connectors	3-4
Safety Considerations	3-5
Installing the Controller	3-6

Chapter 4

Controller Start-up

Procedural Overview	4-1
Controller Start-up	4-2
BIOS Start-up Sequence	4-2
Other BIOS Options	4-3
Device Drivers	4-5
Global Array Manager (GAM)	4-5
In Case of Problems	4-5

Appendix A

IBBU Option

Product Description	A-1
Features	A-1
Installation	A-2
Operation	A-4
Battery Conditioning Prior to Use	A-4
Set-up – Enabling the Write-Back Cache	A-4
Battery Backup Capacity	A-4
Maintenance	A-5
Removing the Battery Backup Module	A-5
Functional Description	A-6
General Operational Description	A-6
Status Indication	A-6
Battery and Charge Circuit	A-7
Recycling the Battery	A-7
IBBU Specifications	A-8
On-board Battery	A-8
Battery Charge Life	A-8
External Battery	A-8
Module Dimensions	A-8
Environmental	A-8

Appendix B

DAC960PG/PJ Specifications

General Hardware Specifications	B-1
DAC960PG	B-1
DAC960PJ	B-2
Physical and Environmental Specifications	B-3

Appendix C

Error Messages

Error Messages	C-1
Start-up Error Messages	C-1
Drive Check Error Messages	C-1
Aborted Installation	C-2
NVRAM Error	C-3
System Reboot or Power Down Messages	C-3

Appendix D

Regulatory Information

FCC Class B Compliance.....	D-1
FCC Declaration of Conformity	D-2
Community of Europe	D-3
Underwriters Laboratories Listed	D-4

Glossary

Chapter 1

Introduction

This chapter covers:

- **Product description**
- **Standard package contents**
- **User supplied items**

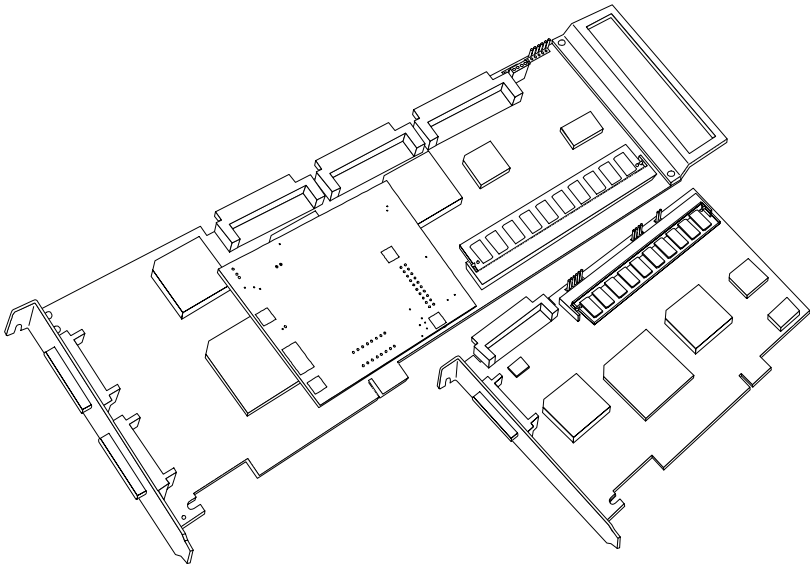


Figure 1-1. DAC960PG/PJ Disk Array Controllers

Product Description

The Mylex DAC960PG™ and DAC960PJ™ controllers are 32-bit PCI to Ultra SCSI RAID controllers designed for high performance file servers. With up to 3 Ultra SCSI drive channels, and support for a cache memory battery backup (full-length card models only), these controllers provide the speed and functionality required by high demand server platforms. A half-card model provides a single drive-channel controller without BBU support. The DAC960PJ is an I₂O ready RAID controller.

Controller Features and Functions

Features of the DAC960PG and DAC960PJ controllers include:

- Ultra SCSI drive channels that support RAID levels 0, 1, 3, 5, 0+1, 10, 30, and 50
- Single-Ended Wide Ultra SCSI (Fast 20) drive support
- High performance RISC processor and EDO ECC DRAM cache (4MB to 128MB) for high speed, fault tolerant I/O transfers
- 512KB, 8-bit flash EEPROM for BIOS and code supports future enhancements through firmware upgrades
- Built-in configuration utilities in BIOS (with firmware 4.06 and above)
- An Intelligent Battery Backup (IBBU) option to protect data in cache during power loss is available for full-length card models

Operating System Support

- Microsoft Windows NT 3.51 and NT 4.0
- Novell NetWare 3.12 or 4.xx
- SCO UNIX 3.2.4, ODT, and OSR 5.0
- SCO UnixWare v2.1
- MS-DOS 5.x, 6.x, and above
- Microsoft Windows NT or Windows 95 – for Global Array Manager (GAM) client only

Standard Package Contents

The following items are supplied with the standard shipping package:

Hardware

- DAC960PG or DAC960PJ Disk Array Controller with documentation
- Intelligent Battery Backup (IBBU) port loopback terminator plug (on full-length cards only), or...
- Optional Intelligent Battery Backup Unit (IBBU)

Note

A loopback terminator plug must be installed on the full-length version of the DAC960PG/PJ controller's IBBU connector if the optional IBBU is not present.

Software

- Disk Array Controller Configuration (DACCF) utility with documentation
- Disk Array Controller Software Kit (OS, drivers, and GAM Server) with documentation
- Optional Global Array Manager (GAM client) software utility with documentation

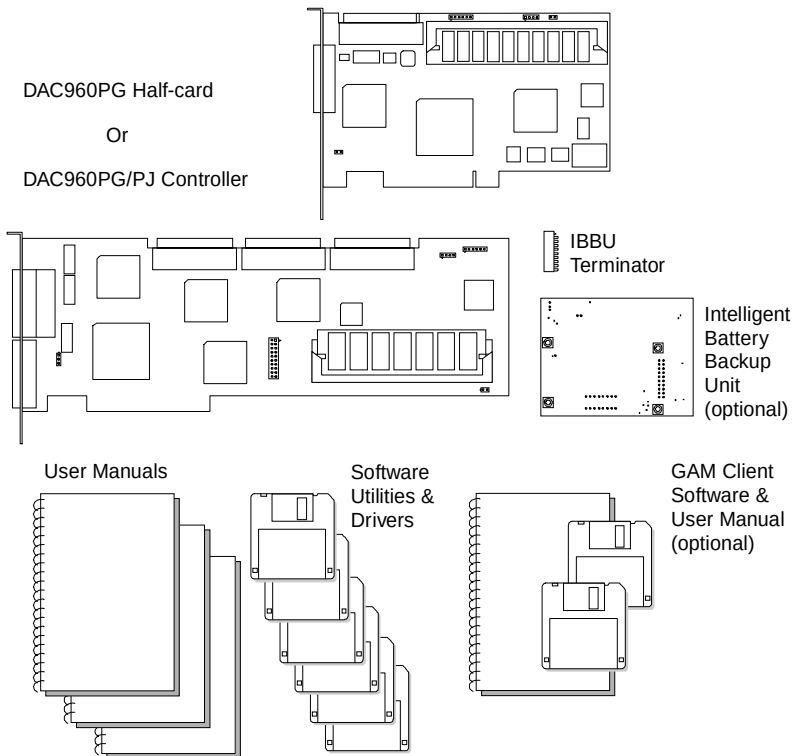


Figure 1-2. Standard Package Contents

User-supplied Items

The following user-supplied items are required to perform this installation:

- IBM-PC™ compatible host system with an available PCI slot
- Network operating system software (as required)
- SCSI cables to connect the controller and disk drives
- Static grounding strap or electrostatic discharge (ESD) safe work area
- Disk array enclosure (or equivalent) and SCSI disk drives*

*SCSI drive compatibility list is available from Mylex Technical support

Chapter 2

Preinstallation Planning

This chapter covers:

- **SCSI termination**
- **SCSI cabling**
- **SCSI drive preparation**
- **Limitations on mixing Narrow and Wide SCSI drives**

Mylex Disk Array Controllers are designed to work in a variety of SCSI RAID application environments. Certain configuration steps need to be performed prior to installing the controller into a RAID environment.

SCSI Termination

The DAC960PG and DAC960PJ are equipped with automatic SCSI termination circuitry. If the controller is at the end of a SCSI bus, it automatically enables on-board termination.

If all the SCSI devices on a channel are connected either to an internal connector of a channel, or to an external connector of a channel, the end of the SCSI bus farthest from the controller must have a terminator installed. In this case, the controller automatically *enables* on-board termination. See Figure 2-1 for examples of internal or external drive configurations.

If some SCSI devices are connected to the internal connector of a channel, and some are connected to the external connector of the same channel, the two ends of the SCSI bus farthest from the controller must each be terminated. In this case, the controller automatically *disables* on-board termination. See Figure 2-1 for an example of an internal – external drive configuration.

Note

For this discussion, assume that the illustrated internal and external connectors are both on the same channel.

It is better to terminate the ends of the SCSI bus itself than it is to terminate the end devices on the bus. This allows hot swap devices to be added or removed from the SCSI bus without affecting termination.

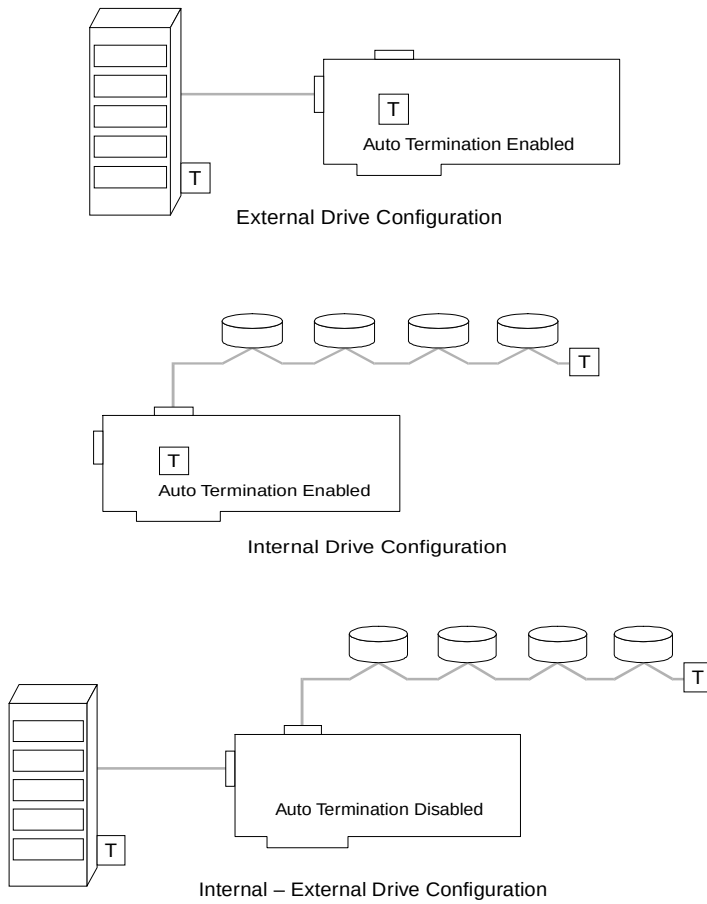


Figure 2-1. DAC960 Controller Termination Examples

SCSI Cabling

Each Ultra SCSI channel supports up to 15 drives.

The total allowable SCSI bus lengths will be limited to the single-ended bus lengths shown in Table 2-1.

Table 2-1. Supported SCSI Formats and Bus Lengths

SCSI Drive Type*	Bus Speed, Max.(MB/Sec)	Bus Width, (Bits)	Bus Length, Max.(Meters)	Drives** per Channel, Max.
SCSI-1	5	8	6	7
Fast SCSI	10	8	3	7
Fast Wide SCSI	20	16	3	15
Ultra SCSI	20	8	1.5	7
Ultra SCSI	20	8	3	3
Wide Ultra SCSI	40	16	—	15†
Wide Ultra SCSI	40	16	1.5	7
Wide Ultra SCSI	40	16	3	3

* SCSI Trade Association terms

** The SCSI ID reserved for the RAID controller is not included in this total.

† The maximum number of devices allowed on a Wide Ultra SCSI channel is 8 including the controller, unless bus extender technology is used.

SCSI Drive Preparation

Prepare the drives for installation as follows:

- Remove any terminators attached to the drive or set any drive termination jumpers to the *disabled* position.
- Set the SCSI addresses on the drives.

 Note

Each drive on a channel must have a unique ID chosen from 0 through 6 or 8 through 15. ID 7 cannot be used as a drive ID because it is reserved for the controller.

- Enable term power on the drives.

Refer to the drive manual for specific information about drive configuration settings.

To get best performance from the controller, the SCSI drives should be equally distributed across the SCSI channels, and the controller's data transfer rate should be set to the optimum rate for the drives being used.

Mixing Narrow and Wide SCSI Devices

Narrow and Wide SCSI devices must not be mixed on a single channel. If mixing Narrow and Wide SCSI devices is desired, at least one channel must be dedicated to Narrow SCSI, and at least one channel must be dedicated to Wide SCSI.

Chapter 3

Installation

This chapter covers:

- Preparation
- Connectors and jumpers
- Safety considerations
- Controller installation procedures

Before You Begin

Installing a Mylex DAC960 PCI to Ultra SCSI RAID controller is no more difficult than installing any PCI adapter card. Follow these steps and then follow the installation procedures in this chapter.



WARNING

Disconnect the system from the electrical wall outlet before opening the system cabinet. Working with the system covers off and power applied to the system can result in shock and serious injury.

1. Follow a safe anti-electrostatic discharge (ESD) procedure such as using a grounding wrist strap connected to a known ground source.
2. Power off the system and disconnect the power cables before starting the installation. Refer to the instructions provided in your system documentation. Do not disconnect cables or power cords while system power is on.
3. Read all of the instructions in this chapter completely before proceeding. Follow the Notes, Cautions, and Warnings described in this manual and marked on the equipment.
4. Safety check the installation before powering on the system.
 - Make sure that all of the cabling Pin 1 locations are correct and that all cables are firmly seated in the connectors.
 - Make sure all SCSI conventions (cable type, cable length, termination, SCSI IDs, etc.) are followed.

Connectors and Jumpers

Up to three Ultra SCSI channels are supported on the DAC960PG/PJ. The SCSI connector locations are shown in Figure 3-1.

Be sure that the Jumper JP6 has a jumper installed (see Figure 3-1 and Table 3-1).

Note

The half-card has only one SCSI channel. Its jumpers are numbered differently than on the full size cards. See Figure 3-2 and Table 3-2 for half-card connector and jumper references.

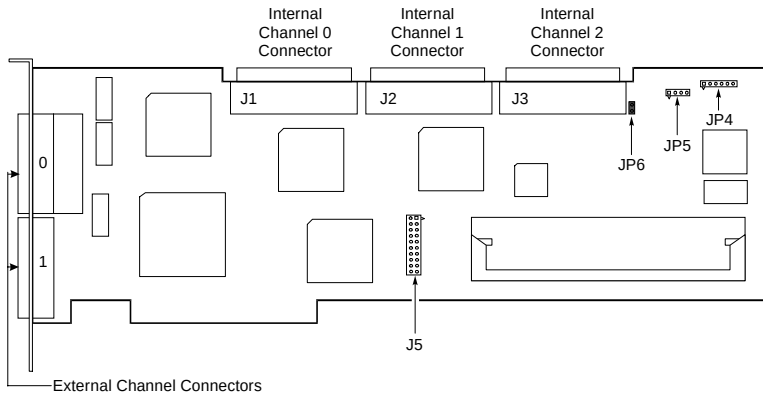


Figure 3-1. Full-length Card Component Layout

Table 3-1. Full-length Card Jumper and Connector Descriptions

Component	Description	Default Setting
JP4	Connector for optional front panel LED harness	—
JP5	Serial Port Connector	—
JP6	Reserved	Installed
J5	Intelligent Battery Backup connector – If an IBBU is not installed, a loopback plug must be installed in this socket.	Installed at factory

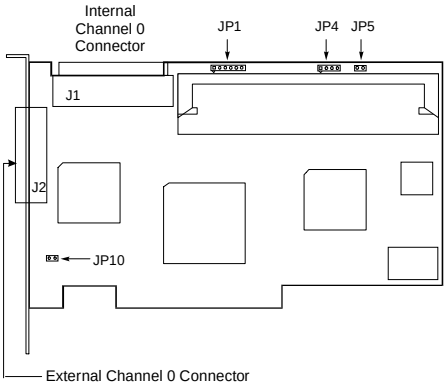


Figure 3-2. Half-card Component Layout

Table 3-2. Half-card Jumper and Connector Descriptions

Component	Description	Default Setting
JP1	Connector for optional front panel LED harness	–
JP4	Serial Port Connector	–
JP5	Not Used	Off
JP10	Not Used	Off

External SCSI Connectors

The external connectors on the controller are female, Dual In-line Micro SCSI connectors. Figure 3-3 shows the configurations that are available on both the DAC960PG and the DAC960PJ.

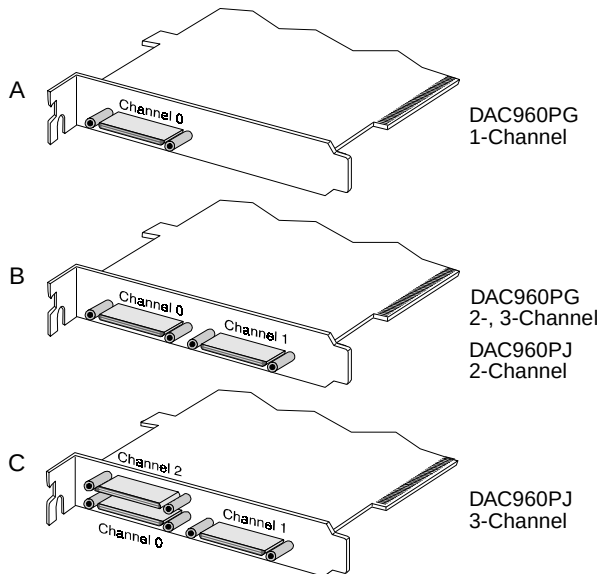


Figure 3-3. Configurations of 1, 2, and 3 External SCSI Connectors

The corresponding cable connector that fits the controller is available from AMP and from Honda. Part numbers for the Honda connector and hood are:

Connector – HDRA–E68MA1

Hood – HDRA–E68LGKPE

The AMP part number for the connector assembly (with offset hood and jack screws) is:

Connector assembly – 787801-1

The correct offset hood and connector assembly is critical if cables are to be connected to simultaneously to external channels 0 and 2 on the three-channel version of the DAC960PJ. Proper alignment of the offset hood cable assembly is shown in Figure 3-4.

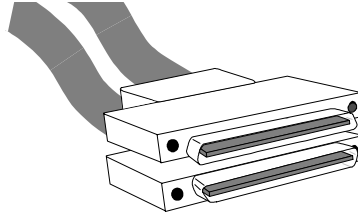


Figure 3-4. Offset Hood Cable Assembly Alignment, 3-Channel DAC960PJ

Safety Considerations

Be sure to observe the following precautions before beginning the controller installation procedure:

Caution

Anti-static handling procedures are required. Leave the controller in its anti-static bag until it is time to plug the controller into the PCI slot. The use of a grounded wrist strap and other ESD protective measures are highly recommended.

WARNING

Disconnect the system from the electrical wall outlet before opening the system cabinet. Working with the system covers off and power applied to the system can result in shock and serious injury.

Installing the Controller



Note

If an Intelligent Battery Backup Unit (IBBU) is to be installed on a full-length card, it should be done before the controller is installed into the host system. Refer to Appendix A for information on installing the IBBU.

Follow these steps:

1. Power-off all enclosures and the system components and disconnect their power cords.
2. Remove the covers or the cabinet as necessary to access the I/O slots on the system board.
3. Choose a vacant PCI slot and remove the metal cover plate from the slot's access port (usually at the back of the cabinet). Save the retaining screw.
4. Plug the controller firmly into the PCI slot so that the controller's external connectors can be accessed through the access port. Use the retaining screw to secure the controller by its mounting bracket.
5. Connect the cables from the disk array(s) to the drive channel port(s) on the controller.
6. Look to confirm that all drive channels in use are properly terminated.
7. **Safety check** the installation.
8. Reconnect the power but DO NOT POWER ON the system at this time.
9. Proceed to the next chapter.

Chapter 4

Controller Start-up

This chapter covers:

- **Start-up procedures**
- **BIOS options**
- **Driver installation**
- **What to check in case of problems**

This chapter describes the DAC960PG and DAC960PJ controller start-up procedures and messages produced by the BIOS during start-up or re-boot, and explains the BIOS options that are available for configuring controller operation. This chapter also contains a brief introduction of necessary software configuration with references to additional documentation.

Procedural Overview

The steps covered in this chapter include:

1. Setting BIOS options
2. BIOS configuration utility – refer to the *Disk Array Controller Configuration Utilities (DACCF) Installation Guide and User Manual* (P/N 771953)
3. Loading the operating system and operating system drivers – refer to the *Disk Array Controller Software Kit Installation Guide and User Manual* (P/N 771929)
4. Installing Global Array Manager – refer to the *Global Array Manager Client Software Installation Guide and User Manual* (P/N 771961)

Controller Start-up

The controller start-up procedure is the first step in confirming that the controller is correctly installed and working properly. The start-up procedure should be performed prior to any software configuration.

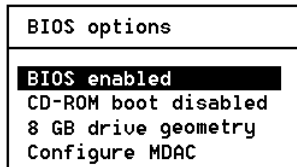
BIOS Start-up Sequence

After physically installing the controller and connecting the cabling, do the following:

1. Power on the computer.
2. Watch the messages on the screen for the following prompt to be displayed:

Press Alt-M for BIOS options

3. Press **Alt-M** to get into the *BIOS Options* menu.
4. The *BIOS Options* menu provides the following items to choose from:



5. To select any of the items in the menu, highlight the selection with the **Up Arrow** or **Down Arrow**. Press **Enter** to toggle any of the first 3 items.

Note

BIOS must be enabled to toggle the CD-ROM boot parameters.

To run the Mylex Disk Array Controller Configuration Utility, select *Configure MDAC* and press **Enter**.

The on board Mylex Disk Array Configuration Utility functions identically to DACCF. For detailed information on how to configure MDAC, refer to the *Disk Array Controller Configuration Utilities (DACCF) Installation Guide and User Manual* (P/N 771953).

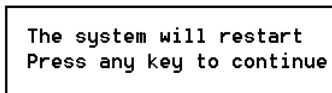
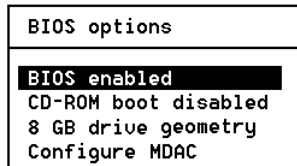
Other BIOS Options

In addition to Configure MDAC, the other available BIOS options are:

- BIOS disabled / enabled
- CD-ROM boot disabled / disabled
- 2GB / 8GB drive geometry

BIOS Disable or Enable

This option must be enabled in order to change the following BIOS options. When BIOS Disable or Enable is selected, the following message will be displayed. Pressing any key will restart the system.



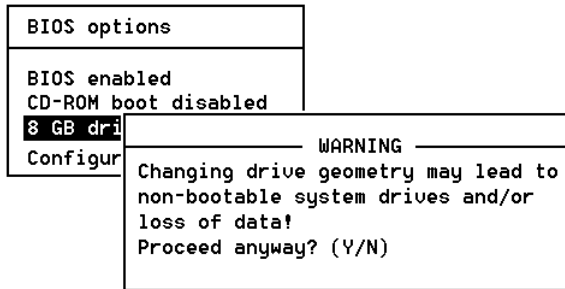
CD-ROM Boot Disable or Enable

The default for this option is for the CD-ROM boot to be disabled (e.g., the system will boot from a hard drive. If a bootable CD is installed in the CD-ROM drive, the system can boot from the CD if this option is enabled.

If the CD-ROM boot option is enabled, the CD-ROM will take priority over the disk drives. For example, under MS-DOS, the disk drive that is normally *Drive C* will become *Drive D*. All subsequent drive IDs will similarly be moved down.

Enable 8GByte or 2GByte Drives

This setting affects how the BIOS reads the disk drives. Drive geometries can be toggled between 8 GB and 2 GB. The default is 2 GB. The drive geometry must be set, and then the drive must be formatted (or reformatted).



The default BIOS geometry of the controller is set to 2 GB. This means that the BIOS only sees the first 2 GB of any drive that has been configured on the controller. This is adequate in most applications, since BIOS is only used to boot the operating system. However, it does mean the operating system must be installed in the first 2 GB of the capacity of the configured drive. If this is not adequate, the BIOS geometry can be changed to 8 GB, allowing the BIOS to see the first 8 GB of capacity.

Caution

Changing this setting after data has been stored can make the data unreadable. If you have already configured your array and have stored data, you should *not* change this setting.

Device Drivers

Device drivers that make the controller compatible with the supported operating systems can be found in the Mylex Disk Array Controller Software Kit. For details on how to install and load drivers, refer to the *Disk Array Controller Software Kit Installation Guide and User Manual* (P/N 771929).

Global Array Manager (GAM)

The controller can be configured using GAM. GAM can also be used from the server or a system client to monitor status and verify data integrity of disks connected to the controller while the system and disks are running.

For details on how to install and run GAM, refer to the *Global Array Manager Client Software v2.1x Installation Guide and User Manual* (P/N 771961). This manual can be obtained at no cost from the Mylex web site (www.mylex.com).

In Case of Problems

If problems are encountered during start-up, check the following:

- Check SCSI cabling for loose connections, pin mismatches (make sure pin 1 on the cable matches pin 1 on the connector), bent pins, and damaged or crossed cables.
- Check termination.
- Check sure each drive on a SCSI channel has a unique SCSI ID other than 7.

Appendix A

IBBU Option

Product Description

The Intelligent Battery Backup Unit (IBBU) option is an add-on module that protects the data in the RAID controller's cache memory in the event of a power failure. This option is available only for full-length form factor versions of the DAC960PG/PJ PCI to Ultra-SCSI RAID Controller.

The battery backup module monitors the write back cache on the DAC960PG/PJ, and provides power to the cache if it contains data not yet written to the drives when power is lost. The controller, with the IBBU installed, together occupy only one PCI slot on the host backplane.

Features

Some of the new features of the IBBU include:

- Gas gauge circuit for battery charge monitoring
- Quick charge to replenish a drained battery
- Support for low-power EDO ECC RAM modules

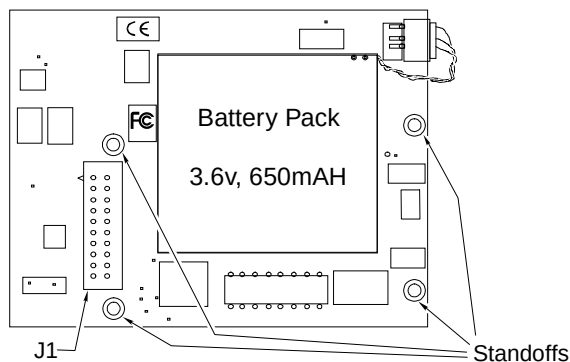


Figure A-1. IBBU Components

Installation

Tools Needed

The only tool needed for the installation is a small, flat-blade screwdriver

Procedure

1. If the DAC960PG/PJ is not already removed from the system, power the system down and then remove the DAC960PG/PJ.



WARNING

Disconnect the system from the electrical wall outlet before opening the system cabinet. Working with the system covers off and power applied to the system can result in shock and serious injury.

2. Remove the loopback plug from J5 on the DAC960PG/PJ. Keep the loopback plug in a safe place, in case the IBBU needs to be removed at a later time.

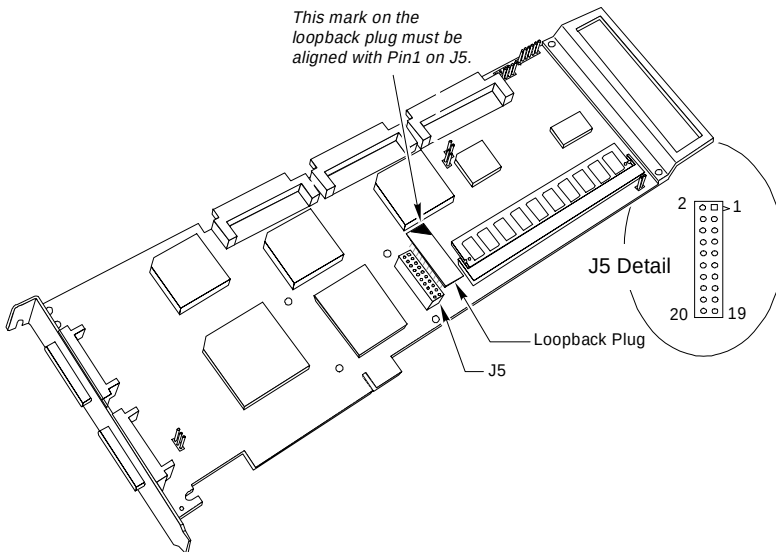


Figure A-2. Removing the Loopback Plug

3. Remove the protective pin cover and peel-off label from J1 on the IBBU.
4. Leaving the 4 standoffs attached to the IBBU, remove a nylon screw from the free end of each nylon standoff.

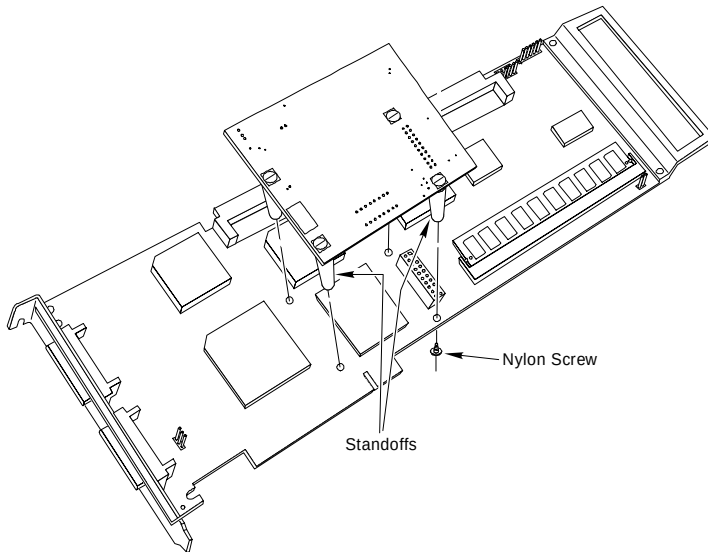


Figure A-3. Installing the IBBU

5. Install the IBBU so that J1 on the IBBU connects to J5 on the DAC960PG/PJ. Pin 1 on the IBBU's J1 must connect to hole 1 on the DAC960PG/PJ's J5. The mounting holes on the IBBU will line up with the mounting holes on the DAC960PG/PJ if the connectors are plugged in correctly.
6. Be sure the 4 standoffs line up with the 4 holes in the DAC960PG/PJ. Place a nylon screw through a hole from the back of the DAC960PG/PJ into a standoff, and turn the screw to the right until it is snug (not too tight). Repeat this step with the remaining 3 standoff screws.

Operation

Battery Conditioning Prior to Use

Battery conditioning is automatic. There are no manual procedures for battery conditioning or preconditioning to be performed by the user.

Set-up – Enabling the Write-Back Cache

The write-back cache is enabled by toggling the write-back/write-through mode switch. The write-back/write-through mode switch is accessed in the Onboard Configuration Utility, DACCF, or in GAM. Refer to the *DACCF Utilities Installation Guide and User Manual* or the *Global Array Manager Client Software Installation Guide and User Manual* for instructions on how to examine and change the mode switch.

Battery Backup Capacity

Battery backup capacity is defined as the maximum duration of a power failure for which data in the cache can be maintained by the battery. The IBBU's backup capacity varies with the memory configuration installed on the DAC960PG/PJ. Battery backup capacity can be reasonably expected according to Table A-1

Table A-1. IBBU Capacity vs. Cache Memory Configuration

Capacity	Mem Type	Battery Backup Duration	
		Typical	Minimum
4 MB	EDO ECC RAM	72 hours	40 hours
8 MB	EDO ECC RAM	40 hours	20 hours
16 MB	EDO ECC RAM	68 hours	28 hours
32 MB	EDO ECC RAM	30 hours	14 hours
64 MB	EDO ECC RAM	35 hours	23 hours
128 MB	EDO ECC RAM	20 hours	12 hours

Maintenance

No end user maintenance is required on the IBBU. It is recommended, however, that the battery charge level be periodically checked using the Gas Gauge function in GAM (see the *Global Array Manager Client Software Installation Guide and User Manual*).

Removing the Battery Backup Module

The battery backup module will need to be removed for one of the following reasons:

1. The NiCd battery will no longer accept a charge properly (NiCd battery life expectancy is approximately 5 years).
2. The cache memory needs to be removed from the DAC960PG/PJ for replacement or upgrade.

When one of these conditions occur, observe the following precautions:



WARNING

Replace the battery only with the same or equivalent type of battery recommended by the battery manufacturer. Dispose of used batteries according to the manufacturer's instructions.



WARNING

Do not attempt to install, remove, or change a cache SIMM on the DAC960PG/PJ with the IBBU installed. Serious damage to the SIMM and/or the battery backup unit will occur if this precaution is not followed.



Caution

If you plan to operate your DAC960PG/PJ without the IBBU, be sure to reinstall the loopback plug (see the “Mechanical Installation Procedure” section and Figure A-2).

Functional Description

General Operational Description

Whenever the system is running, the IBBU is standing by, monitoring the voltage level of VCC. In the event of a power failure, the VCC voltage level will begin to drop. When the IBBU detects this voltage drop, it checks the status of the disk cache. If the cache is empty, the IBBU does nothing.

If the cache contains data during a power failure, the IBBU will maintain cache data integrity until the power is restored. When power is restored and the system finishes the bootstrap process, the cache contents will be written to the disk array. The cache contents will then be flushed from the cache.

Status Indication

The status of the battery can be checked with the gas gauge feature that can be accessed in GAM (version 2.1x or greater is needed). The gas gauge appears on the screen as two meters— a battery power meter and a charge level meter— each calibrated from 0 to 100.

The battery power meter indicates the battery capacity in hours. It will indicate a charge duration of up to 100 hours. The firmware will detect the Mylex supplied SIMM and assign a value based upon the charge level of the battery and the power consumption rate of the SIMM.

Caution

Do not use SIMMs which are not supplied by Mylex.

The charge level meter displays the charge state of the battery expressed in percent (100% indicates a fully charged battery).

When the meter on the right indicates the battery is fully charged, the meter on the left will indicate the maximum time in hours that the battery can be expected to maintain cache data integrity. This value will vary depending upon which Mylex supplied SIMM is being used (see Table A-1).

Note

When the charge level is 100%, the *current number of hours* and *maximum number of hours* (printed out below the left dial) will be equal.

Battery and Charge Circuit

On-board Battery

The on-board battery is rated at 3.6 v with a capacity of 650 mAH. The IBBU has a DC-DC converter that converts the 3.6 v from the battery to 5 v, which is the nominal voltage needed to replace VCC if a power failure should occur.

Battery Charger

Battery charging and conditioning are automatically handled by the IBBU. No manual preconditioning needs to be performed by the user. If the battery capacity falls below a predetermined level (which is likely to happen during a power failure), the battery charger goes into a quick charge mode. If the battery is fully charged, the charger goes into a trickle charge mode.

Recycling the Battery

The on-board battery that comes with the IBBU has the logo of the Rechargeable Battery Recycling Corporation (RBRC) stamped on it. The logo means that recycling fees have been prepaid on this battery pack.

Caution

Do not dispose of a rechargeable battery with regular trash in a landfill. Rechargeable batteries contain toxic chemicals and metals that are harmful to the environment. Improperly disposing of rechargeable batteries is also illegal.



Figure A-4. RBRC Logo

The RBRC is a non-profit corporation that promotes the recycling of rechargeable batteries, including nickel-cadmium batteries.

Information on the RBRC program and the locations of participating recycling centers can be obtained by telephoning 1-800-8-BATTERY (in the USA), and following the recorded instructions. The information obtained from this telephone number is updated frequently, since the RBRC program is growing, and new recycling locations are being added regularly.

IBBU Specifications

On-board Battery

Electrical Properties

- 3 NiCd 1.2 V, 650 mAH cells, connected in series for a total of 3.6V at 650mAH

Physical Description

- Nominal pack size (in inches): 1.89(L) X 2.01(W) X 0.33 (H)

Battery Charge Life

Depends upon memory in use

External Battery

Not supported

Module Dimensions

Length: 3.75 inches
Width: 2.875 inches

Environmental

Temperature	Operating:	0°C to +40°C (+32°F to 104°F)
Storage:		-40°C to +60°C (-40°F to +140°F)
Humidity	Operating:	45% to 85% relative humidity
Non-operating:		45% to 85% relative humidity

Appendix B

DAC960PG/PJ Specifications

General Hardware Specifications

DAC960PG

Controller	DAC960PG
CPU	Intel i960 RP® RISC 32-bit microprocessor, 33MHz
Memory	EDO ECC RAM, 60ns, 72-pin SIMM, <i>n</i> x 40 (Use only Mylex supplied SIMMS) Minimum: 4 MB Optional: 8, 16, 32, 64, or 128 MB
Cache	Write: Selectable – Write Through or Write Back Error Protection: Error Correction Code (ECC)
Firmware	ROM Type, Flash EEPROM, 512K x 8
PCI	I/O Processor: Embedded Intel i960 RP 32-bit bus Transfer Rate - Up to 133MB/second
SCSI	Mylex BA-81C15, one per channel Data Rate - Up to 40MB/second, when using Fast/Wide 16-bit mode

DAC960PJ

Controller	DAC960PJ
CPU	Intel i960 RD® RISC 32-bit microprocessor, 66MHz
Memory	EDO ECC RAM, 60ns, 72-pin SIMM, <i>n</i> x 40 (Use only Mylex supplied SIMMS) Minimum: 4 MB Optional: 8, 16, 32, 64, or 128 MB
Cache	Write: Selectable – Write Through or Write Back Error Protection: Error Correction Code (ECC)
Firmware	ROM Type, Flash EEPROM, 512K x 8
PCI	I/O Processor: Embedded Intel i960 RD 32-bit bus Transfer Rate - Up to 133MB/second
SCSI	Mylex BA-81C15, one per channel Data Rate - Up to 40 MB/second when using Fast/Wide 16-bit mode

Physical and Environmental Specifications

Controller DAC960PG/PJ

Form Factor:

Full-length card	Length	12.283 inches
	Width	4.2 inches
	Component Height (max.)	0.105 inches – solder side 0.590 inches – component side
	Board Width (with IBBU)	Not to exceed the width of one PCI slot
Half-card	Length	7.225 inches
	Width	4.2 inches
	Component Height (max.)	0.105 inches – solder side 0.590 inches – component side
	Board Width	Not to exceed the width of one PCI slot
Temperature	Operating	0°C to +55°C (+32°F to 131°F)
	Storage	-20°C to +70°C (-4°F to +158°F)
Humidity	Operating	10% to 90% relative humidity (non-condensing)
	Storage	10% to 90% relative humidity (non-condensing)
Altitude	Operating	Up to 3,048m (10,000 ft)
	Storage	Up to 15,240m (50,000 ft)

Appendix C

Error Messages

Error Messages

Start-up Error Messages

The BIOS looks for any initialization message posted by the firmware during the start-up sequence. If a message is found, one of the following errors displays onscreen and the installation process aborts.

```
DAC960Pn fatal error--memory test failed
DAC960Pn fatal error--command interface test failed
DAC960Pn hardware error--run diagnostics to pinpoint error
DAC960Pn firmware checksum error--reload firmware
```

Drive Check Error Messages

If the firmware finds a valid controller configuration, but it doesn't match the SCSI drives currently installed, one or more of the following messages display:

```
Unidentified device found at channel x...
Device identified for chn x, tgt y found at chn x', tgt y'
SCSI device at chn x, tgt y not responding
```

If any of the above messages are displayed, the firmware will not proceed any further in the initialization process, except to find other mismatches. Then, the BIOS prints out the following:

```
DAC960Pn Configuration Checksum error--run configuration
utility
```

If the firmware detects that during the last power cycle the system was turned off abruptly leaving some incomplete write operations, the following message appears:

```
Recovery from mirror race in progress
```

The following messages may also appear:

```
Adapter cannot recover from mirror race!
Some system drives are inconsistent!
```

During the initialization, if the firmware fails to respond to the BIOS inquiry within two minutes, the following message displays:

```
DAC960Pn not responding--no drives installed.
```

The BIOS then inquires the firmware for its version number and other information, and prints out the following message:

```
DAC960Pn firmware version x.xx
```

One or more of the following messages will be displayed if the firmware reports the following conditions:

```
Warning: X system drives are offline
```

```
Warning: X system drives are critical
```

```
Warning: The following SCSI devices are dead--chn  
x, tgt y...
```

```
No system drives found: None installed
```

```
X system drives installed
```

The BIOS repeats the same process for additional RAID controllers present in the system. Then it proceeds to boot, if possible, from the first system drive on the first controller.

Aborted Installation

With Firmware 4.x, the installation aborted message is displayed when the BIOS finds that the configuration of the disk drives, as stored in the NVRAM and configuration on disk, is different from what it senses at boot time. When this happens, (and a brand new installation is not being attempted) the cause is often a faulty cable or drive, or a loose connection. Check all of the connectors, cables, drives, and try to boot. If the error persists, it most likely indicates a genuine failure and needs to be corrected. To correct it, boot and run the on-board Mylex Disk Array Configuration Utility (see Chapter 4). For more information, refer to the *Disk Array Controller Configuration Utilities (DACCF) Installation Guide and User Manual* (P/N 771953).

NVRAM Error

With Firmware 4.x, if the BIOS displays a mismatch between the NVRAM and the COD, no drives will be installed. Normally this error will not be displayed. If it is, boot and run the on-board Mylex Disk Array Configuration Utility (see Chapter 4), to recover from the error. For more information, refer to the *Disk Array Controller Configuration Utilities (DACCF) Installation Guide and User Manual*.

System Reboot or Power Down Messages

Status messages may also be available from LED indicators connected to the DAC960PG/PJ. The Write Pending indicator is especially important when preparing to power-down the system.

The DAC960PG/PJ is a caching controller with up to 128 MB of cache memory, data may still be in the cache waiting to be written to the disk drives, when the system reports that a write command was completed. It is *very important* to make sure that all data is written to the disk before rebooting or powering down the system, or you may lose data. It is always a good idea to wait for 15 seconds before resetting or rebooting the system.

If using the 'Write Pending' LED indicator, wait 3 seconds after the LED has gone off before resetting or rebooting the system (the optional cache battery backup may also be used to prevent data loss).

Appendix D

Regulatory Information

FC Class B Compliance

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS:

3. THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND
4. THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is not guarantee that interference will not occur in a particular installation.

If this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna
2. Move the equipment away from the receiver
3. Plug the equipment into an outlet on a circuit different from that to which the receiver is powered.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions.

All external connections should be made using shielded cables.

Caution

Only equipment certified to comply with Class B (computer input/output devices, terminals, printers, etc.) should be attached to this equipment.

Any changes or modifications to the equipment by the user not expressly approved by the grantee or manufacturer could void the user's authority to operate such equipment.

FC Declaration of Conformity

Manufacturer's Name: Mylex Corporation
Manufacturer's Address: 34551 Ardenwood Blvd.
Fremont, CA 94555-3607
USA

Declares that the product:

Product Name: 1, 2, and 3-Channel Ultra SCSI RAID
Controller

Model Numbers: **DAC960PG, DAC960PJ**

Year of Manufacture: 1998

Conforms to the following Product Specification(s):

EMC: EN 50081-1:1992/EN 55022:1992 Class B
EN 50082-1:1992 - Generic Immunity

EN 61000-4-2:1995, 4kV CD, 8kV AD
EN 50140:1995, 3 V/m, 80 - 1000 MHz, 80%
EN 61000-4-4:1995, 0.5kV I/O, 1kV Power

Supplementary Information:

The product herewith complies with the requirements to the EMC Directive 89/336/EEC

Declaration that the equipment specified above conforms to the above directive(s) and standard(s) is on file and available for inspection at the manufacturer's address cited above.

Community of Europe

CE mark is rated for the DAC960PG and DAC960PJ as follows:

CISPR 22 Radiated Emission

EN55022, EN5082-1 Generic immunity standard for the following:

IEC 801-2 ESD, IEC 801-3 Radiated, and IEC 801-4 EFT/Burst

Warning!

This is a Class B product. In a residential environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Achtung!

Dieses ist ein Gerät der Funkstörgrenzwertklasse B. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Avertissement!

Cet appareil est un appareil de Classe B. Dans un environnement résidentiel cet appareil peut provoquer des brouillages radioélectriques. Dans ce cas, il peut être demandé à l'utilisateur de prendre des mesures appropriées.

Underwriters Laboratories Listed



Battery Backup Unit

See “Intelligent Battery Backup Unit.”

Cache

Controller memory used to speed up data transfer to and from a disk.

Cache Flush

Refers to an operation where all unwritten blocks in a Write-Back Cache are written to the target disk. This operation is necessary before powering down the system.

Cache Line Size

See “Segment Size.”

Channel

Refers to one SCSI bus on a disk array controller. Each disk array controller provides at least one channel.

Consistency Check

Refers to a process where the integrity of redundant data is verified. For example, a consistency check of a mirrored drive will make sure that the data on both drives of the mirrored pair is exactly the same. For RAID Level 5 redundancy, a consistency “connect” is a function that allows a target SCSI device (typically a disk drive that received a request to perform a relatively long I/O operation) to release the SCSI bus so that the controller can send commands to other devices. When the operation is complete and the SCSI bus is needed by the disconnected target again, it is “reconnected.”

Disk Failure Detection

The controller automatically detects SCSI disk failures. A monitoring process running on the controller checks, among other things, elapsed time on all commands issued to disks. A time-out causes the disk to be “reset” and the command to be retried. If the command times out again, the disk could be “killed” (taken “offline”) by the controller (its state changed to “dead”). DAC960 controllers also monitor SCSI bus parity errors and other potential problems. Any disk with too many errors will also be ‘killed’.

Disk Media Error Management

DAC960 controllers transparently manage SCSI disk media errors. Disks are programmed to report errors, even ECC-recoverable errors. If ECC EDO RAM is installed, the controller will correct ECC errors.

When a disk reports a media error during a read, the controller reads the data from the mirror (RAID 1 or 0+1), or computes the data from the other blocks (RAID 3, RAID 5), and writes the data back to the disk that encountered the error. If the write fails (media error on write), the controller issues a “reassign” command to the disk, and then writes the data to a new location. Since the problem has been resolved, no error is reported to the system.

When a disk reports a media error during a write, the controller issues a “reassign” command to the disk, and writes the data out to a new location on the disk.

Drive Groups (or Drive Packs)

A group of individual disk drives (preferably identical) that are logically tied to each other and are addressed as a single unit. In some cases this may be called a drive “pack” when referring to just the physical devices. Up to eight (8) drives can be configured together as one drive group.

All the physical devices in a drive group should have the same size, otherwise each of the disks in the group will effectively have the capacity of the smallest member. The total size of the drive group will be the size of the smallest disk in the group multiplied by the number of disks in the group. For example, if you have 4 disks of 400MB each, and 1 disk of 200MB in a pack, the effective capacity available for use is only 1000MB (4*200), not 1800MB.

Hot Replacement of Disks (Hot Swap)

The design of the DAC960 Series controllers allows for the replacement of failed hard disk drives without interruption of system service. In the event of a SCSI drive failure on a properly configured system (where the data redundancy features of the controller are used), system service continues without interruption. A message is generated by the system to alert the system operator.

When a replacement drive becomes available, the system operator can remove the failed disk drive, install a new disk drive, and instruct the controller to “rebuild” the data on the new drive, all without interrupting system operations.

Once the rebuild is complete, the controller will be brought back into a fault tolerant state.

IBBU

See “Intelligent Battery Backup Unit.”

Intelligent Battery Backup Unit

The Intelligent Battery Backup Unit (IBBU) is an add-on module that provides power to a DAC960PG/PJ PCI-to-Ultra SCSI RAID Controller cache memory in the event of a power failure. The battery backup module monitors the write back cache on the DAC960PG/PJ, and provides power to the cache if it contains data not yet written to the drives when power is lost.

The DAC960PG/PJ controller, with the IBBU installed, together occupy only one PCI slot on the host backplane.

Logical Drive States

The state of a logical (system) drive can be either ONLINE, CRITICAL, or OFFLINE. Notice that the same term “online” is used for both physical and logical drives.

Online: A Logical Drive is in an “online” state if...

All of its participating SCSI drives are “online.”

Critical: A Logical Drive is in a “critical” state if...

It has been configured at RAID level 1, 3, 5, or 0+1; and

One (and only one) of its SCSI drives is not “online.”

A logical drive is considered “critical” because any failure of another of its SCSI drives may result in a loss of data.

**Note**

I/O operation can only be performed with system drives that are online or critical.

Offline: A Logical Drive is in an “offline” state if...

No data can be read from it or written to it.

System commands issued to offline logical drives are returned with an error status: no operations can be performed on offline logical drives. A logical drive can be “offline” under one of two situations described below:

- It is configured with a redundant RAID level (1, 3, 5, or 0+1), and two or more of its SCSI drives are not “online”; or
- It is configured at RAID level 0, JBOD, or in a spanned set, and one or more of its SCSI drives are not “online.”

Logical Drives

See “System Drives.”

Mirroring

Refers to the 100 percent duplication of data on one disk drive to another disk drive. Each disk will be the mirror image of the other.

Pack

See “Drive Groups (or Drive Packs).”

Parity

See “Rotated XOR Redundancy.”

RAID

RAID stands for Redundant Array of Independent Disks. The DAC960 controllers implement this technology to connect up to 15 SCSI devices per channel. Several different forms of RAID implementation have been defined. Each form is usually referred to as a “RAID level.” All the RAID levels supported by DAC960 Series controllers are shown below.

The appropriate RAID level for a system is selected by the system manager or integrator. This decision will be based on which of the following are to be emphasized:

Disk Capacity

Data Availability (redundancy or fault tolerance)

Disk Performance

RAID Levels

The disk array controllers monitored by this utility support four RAID Advisory Board-approved (RAID 0, RAID 1, RAID 3, RAID 5) and two special RAID levels (RAID 0+1, and JBOD).

Level 0. Block “striping” across multiple drives is provided, yielding higher performance than is possible with individual drives. This level does not provide any redundancy.

Level 1. Drives are paired and mirrored. All data is 100 percent duplicated on a drive of equivalent size.

Level 3. Data is “striped” across several physical drives. Maintains parity information which can be used for data recovery.

Level 5. Data is “striped” across several physical drives. For data redundancy, drives are encoded with rotated XOR redundancy.

Level 0+1. Combines RAID 0 striping and RAID 1 mirroring. This level provides redundancy through mirroring. (Mylex RAID 6)

JBOD. Sometimes referred to as “Just a Bunch of Drives.” Each drive is operated independently like a normal disk controller, or drives may be spanned and seen as a single drive. This level does not provide data redundancy. (Mylex RAID 7)

Level 10. Combines RAID 0 striping and RAID 1 mirroring spanned across multiple drive groups (super drive group). This level provides redundancy through mirroring.

Level 30. Data is “striped” across multiple drive groups (super drive group). Maintains parity information which can be used for data recovery.

Level 50. Data is “striped” across multiple drive groups (super drive group). For data redundancy, drives are encoded with rotated XOR redundancy.

 Note

The host operating system drivers and software utilities remain unchanged regardless of the level of RAID installed. The controller makes the physical configuration and RAID level implementation

Replacement Table

A replacement table contains information regarding which SCSI devices have been replaced by others through standby replacement.

Rotated XOR Redundancy

This term (also known as “parity”) refers to a method of providing complete data redundancy while requiring only a fraction of the storage capacity of mirroring. In a system configured under RAID 3 or RAID 5 (which require at least three SCSI drives), all data and parity blocks are divided between the drives in such a way that if any single drive is removed (or fails), the data on it can be reconstructed using the data on the remaining drives. (XOR refers to the Boolean “Exclusive-OR” operator.) In any RAID 3 or RAID 5 array, the capacity allocated to redundancy is the equivalent of one drive.

SCSI Drive

A disk drive equipped with a SCSI interface (sometimes referred to as a SCSI Disk). Each disk drive will be assigned a SCSI address (or SCSI ID), which is a number from 0 to 7 (0 to 15 under wide or Ultra SCSI). The SCSI address uniquely identifies the drive on the SCSI bus or channel.

SCSI Drive States

Refers to a SCSI drive's current operational status. At any given time, a SCSI drive can be in one of five states: READY, ONLINE, STANDBY, DEAD, or REBUILD.

The controller stores the state of the attached SCSI drives in its non-volatile memory. This information is retained even after power-off. Hence, if a SCSI disk is labeled DEAD in one session, it will stay in the DEAD state until a change is made either by using a system level utility or after a rebuild. Each of the states is described below:

Ready: A SCSI disk drive is in a “ready” state if it...

Is powered on; and

Is available to be configured during the current session but remains unconfigured.

Online: A SCSI disk drive is in an “online” state if it...

Is powered on; and

Has been defined as a member of a drive group; and

Is operating properly.

Standby: A SCSI disk drive is in a “standby” state if it...

Is powered on; and

Is able to operate properly; and

Was NOT defined as part of any drive group.

Dead: A SCSI disk drive is in a “dead” state if it...

Is not present; or

If it is present but not powered on; or

If it failed to operate properly and was ‘killed’ by the controller.

When the controller detects a failure on a disk, it “kills” that disk by changing its state to “dead.” A SCSI drive in a dead state does not participate in any I/O activity. No commands are issued to dead drives.

Rebuild: A SCSI disk drive is in a “rebuild” state...

While it is in the process of being rebuilt. During this process, data is regenerated and written to the disk drive. This state is also referred to as ‘Write-Only’ (WRO).

Segment Size

The Segment Size function is set in conjunction with stripe size and represents the size of the data “chunk” that will be read or written at one time. Under DACCF, the segment size (also known as “cache line size”) should be based on the stripe size you selected. The default segment size for Mylex DAC960 controllers is 8K.

Session

Refers to the period of time between any two consecutive system shutdowns. System shutdown may be either a power off/on, or a hardware reset.

Standard Disk Drive

This term refers to a hard disk drive with SCSI, IDE, or other interface, that is attached to the host system through a standard disk controller.

Standby Replacement of Disks (“Hot Spare”)

The “Standby Replacement” (or “Hot Spare”) is one of the most important features the controller provides to achieve automatic, non-stop service with a high degree of fault-tolerance. The rebuild operation will be carried out by the controller automatically when a SCSI disk drive fails and both of the following conditions are true:

- A “standby” SCSI disk drive of identical size is found attached to the same controller;
- All of the system drives that are dependent on the failed disk are redundant system drives, e.g., RAID 1, RAID 3, RAID 5, RAID 0+1.

 Note

The standby rebuild will only happen on the SAME DAC960 controller, never across DAC960 controllers.

A “Standby” disk can be created in one of two ways:

1. When a user runs DACCF utility, all disks attached to the controller that are NOT configured into any drive group will be automatically labeled as “standby” drives.
2. A disk may also be added (attached at a later time) to a running system and labeled as standby by using the “DAC960 Software Kit” (see appropriate chapters for DAC960 utilities for a particular operating system).

During the automatic rebuild process, system activity continues as normal. System performance may degrade slightly during the rebuild process.

To use the standby rebuild feature, you should always maintain a standby SCSI disk in your system. When a disk fails, the standby disk will automatically replace the failed drive and the data will be rebuilt. The system administrator can disconnect and remove the bad disk and replace it with a new disk. The administrator can then make this new disk a standby.

The standby replacement table has a limit of 8 automatic replacements in any session (from power-on/reset to the next power-off/reset). When the limit of 8 is reached and a disk failure occurs, the standby replacement will occur but will not be recorded in the replacement table.

To clear the ‘standby replacement’ table, reboot the system from a DOS bootable floppy, run the configuration utility and select the option ‘view/update configuration’ from the main menu. A red box labeled ‘Drive Remap List’ will be displayed. Selecting the box will allow you to continue. You should save the configuration without making any changes, and exit the configuration utility. This will clear the replacement table. You may now proceed to boot your system and continue normal operations.

In normal use, the replacement table limit of 8 should not cause any problems. Assuming that a disk fails about once a year (drives we support generally come with a 5-year warranty), the system would run continuously for a minimum of 8 years before the table would need to be cleared.

Stripe Order

The order in which SCSI disk drives appear within a drive group. This order must be maintained, and is critical to the controller's ability to 'Rebuild' failed drives.

Stripe Size

The stripe size is defined as the size, in kilobytes (1024 bytes) of a single I/O operation. A stripe of data (data residing in actual physical disk sectors, which are logically ordered first to last) is divided over all disks in the drive group.

Stripe Width

The number of striped SCSI drives within a drive group.

Striping

Refers to the storing of a sequential block of incoming data across multiple SCSI drives in a group. For example, if there are 3 SCSI drives in a group, the data will be separated into blocks and block 1 of the data will be stored on SCSI drive 1, block 2 on SCSI drive 2, block 3 on SCSI drive 3, block 4 on SCSI drive 1, block 5 on SCSI drive 2 and so on. This storage method increases the disk system throughput by ensuring a balanced load among all drives.

System Drives

A system drive is equivalent to a "logical" drive. System drives are presented to the operating system as available disk drives, each with a capacity specified by the DAC960 Series controller.

Target ID

A target ID is the SCSI ID of a device attached to a DAC960 controller. Each SCSI channel can have up to 15 attached SCSI devices (target ID from 0 to 6, and 8 to 15).

Write-Back Cache

Refers to a caching strategy whereby write operations result in a completion signal being sent to the host operating system as soon as the cache (not the disk drive) receives the data to be written. The target SCSI drive will receive the data at a more appropriate time, in order to increase controller performance. An optional cache battery backup can be used to protect against data loss as a result of a power failure or system crash.

Write Through Cache

Refers to a caching strategy whereby data is written to the SCSI drive before a completion status is returned to the host operating system. This caching strategy is considered more secure, since a power failure will be less likely to cause loss of data. However, a write through cache results in a slightly lower performance.

MYLEX DAC960 Problem Report

Customer Identification				DAC960 Identification							
Name: _____				Date: _____ Purchase Date: _____							
Company: _____				Model _____							
Address: _____				Invoice Number: _____							
_____				Serial Number: _____							
_____				# Chnls: _____ Cache: _____							
Country: _____				Firmware Ver: _____ BIOS Ver: _____							
Phone Number: _____				Make/Model/Size/Type of							
Fax Number: _____				Drives: _____							
				Disk: _____							
				Non-Disk: _____							
System Information											
Motherboard: _____		CPU Speed: _____		BIOS Ver: _____							
Video Adapter: _____		Network Card: _____		MB Memory: _____							
Operating Sys: _____		Other Disk Ctrl: _____		Other Cards: _____							
Pack Configuration				System Drive Configuration							
Indicate in matrix below 1, 2... for member of pack 1, pack 2... respectively. Indicate S, T, C, or O for Standby, Tape, CDROM and other drives.				System Drive	Size	RAID Level	Write Back/ Thru				
				0							
Channel	SCSI ID										
	0	1	2	3	4	5	6				
0								1			
1								2			
2								3			
3								4			
4								5			
								6			
								7			
Problem Description											

This DPR form has been included with your Mylex product as a convenience to both you and our Technical Services Department. If filled out completely, this will greatly assist Mylex personnel in quickly resolving any technical problems or questions you may have. Use the Mylex fax number (510) 745-7715 to transmit this form to the Technical Services Department, or mail to Mylex Corporation, Technical Services Department, 34551 Ardenwood Blvd., Fremont, CA 94555-3607

772014-DAC

Mylex Warranty - Customer Policy

Thank you for purchasing this Mylex product for your computer system. In addition to this high-quality product, your purchase entitles you to the warranty coverage set forth herein. In order to provide this warranty coverage, and to indicate your acceptance of this warranty, we must have the attached Warranty Registration Card completed and returned to us within 15 days of your purchase. Also, in order for us to provide you the highest level of service, we must know where you purchased your MYLEX product.

Three Year Limited Warranty

If at any time during the thirty six month period immediately following the date of original purchase of the MYLEX product enclosed herewith (the "PRODUCT") you discover one or more defects in the material or workmanship, MYLEX will repair, or at MYLEX's sole option, replace the PRODUCT. If the PRODUCT fails to operate at any time within seven days after the date of its original purchase, it will be replaced by MYLEX. Such repair or replacement will be your sole remedy against MYLEX, and MYLEX's only liability to you, for any failure or malfunction of the PRODUCT. The warranty set forth in this paragraph will be void if:

1. The PRODUCT has been installed in an improper manner or in an improper operating environment.
2. The PRODUCT has been modified or repaired by any party other than MYLEX or a MYLEX factory authorized service center.
3. The PRODUCT has been damaged.

Some MYLEX products will have a Warranty Expiration Date label affixed to the product itself. When present, the warranty period will extend through the last day of the month indicated.

This warranty will not apply to, and MYLEX provides no warranty for, any BIOS, software, ROM-based firmware, or any other PRODUCT developed or manufactured by any third party, whether included with this PRODUCT or not. Such warranty or warranties as are provided by third parties, to the extent permitted thereby, shall be made available, and are hereby assigned, by MYLEX to the purchaser of this PRODUCT.

If MYLEX issues a revision to the BIOS, firmware or software included with this PRODUCT within 30 days of your purchase, MYLEX will replace such firmware at no charge except handling fees.

Out of Warranty Service

Mylex products which are ineligible for warranty service may be serviced by MYLEX according to our standard price list, as modified from time to time. A current copy of the standard price list is available from the Technical Support Department.

Limitation of MYLEX Liability

MYLEX's liability arising from the sale, use and disposition of this PRODUCT shall in no event exceed the amount paid to MYLEX for this PRODUCT. MYLEX assumes no liability for damages arising from the use or failure of any MYLEX product. The WARRANTY DESCRIBED ABOVE CONSTITUTES THE ONLY WARRANTY MADE BY MYLEX. MYLEX EXPRESSLY DISCLAIMS ANY AND ALL OTHER WARRANTIES OF ANY KIND WHATSOEVER, WHETHER EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY EXPRESSLY EXCLUDED. IN NO EVENT WILL MYLEX BE LIABLE FOR INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES (INCLUDING WITHOUT LIMITATION LOSS OF DATA, USE, OR INCOME), EVEN IF ADVISED OF SUCH DAMAGES IN ADVANCE. Your sole remedies shall be as provided herein.

Returned Merchandise Procedures

If you suspect that there is a defect in the material or workmanship of this PRODUCT, you should contact the person or company from which you purchased it. That person or company may be able to solve the problem and if not, will be able to contact us for technical assistance or repair.

If it is determined that the PRODUCT must be returned to MYLEX for repair or replacement, contact MYLEX's Technical Support Department at 510-608-2400 before it is returned. Each returned item must have a separate Return Merchandise Authorization (RMA) number, provided by MYLEX.

The following rules apply to all returned items:

1. The PRODUCT must be returned either in its original packaging or in other packaging which is appropriate for the PRODUCT and the manner of shipment, and the RMA number must be displayed prominently on the outside of each such package.
2. If a PRODUCT is determined to be ineligible for warranty service, the customer will be notified before any further action is taken with the PRODUCT.
3. MYLEX will not be responsible for any loss or damage to property shipped with the RMA PRODUCT not originally sold by MYLEX (e.g., coprocessor chips, peripheral boards, memory modules, enclosures, power supplies, or any other accessories or attached items).
4. Any item returned to MYLEX without a valid RMA number will be returned to the shipper.

Products shipped to MYLEX must be shipped or mailed at the shipper's risk, freight prepaid, to the address below.

Mylex Corporation
34551 Ardenwood Blvd.
Fremont, California U.S.A.
94555-3607

Mylex will pay for return freight via such carrier as MYLEX shall deem appropriate.

Technical Support

Technical support, to assist you in resolving problems with MYLEX products, is now available through MYLEX's Technical Support Department. In the U.S.A., the Technical Support Department can be reached by telephone at (510) 608-2400, by FAX at (510) 745-7715, or by e-mail at support@mylex.com. Current hours of operation, which are subject to change, are from 6:00 a.m. to 6:00 p.m. Pacific Time, Mondays through Fridays, **excluding U.S.A. national holidays**. Many problems can also be solved using the Mylex Web site (<http://www.mylex.com>), which has a support area available 24 hours a day for interactive technical support.

Included with the shipment of most MYLEX products is a System Problem Report (SPR) form. When contacting the Technical Support Department for assistance with an installation or compatibility problem, we recommend that this form be completed and sent by facsimile or mail to MYLEX. Completion of this form will allow our Technical Support Department to solve most technical problems expeditiously.

Mylex will make reasonable efforts to address compatibility problems which may arise with respect to third party products, but shall not be responsible for the compatibility of its products with the products of any third party. Customers are advised to verify each product's compatibility with their installation before committing to any particular procurement plan.

WARRANTY REGISTRATION CARD

To validate your warranty and receive any future updates concerning your product, you must complete and return this Warranty Registration Card within 10 days of purchase. (Please Print)

NAME: _____ COMPANY: _____

ADDRESS: _____ CITY: _____

STATE: _____ ZIP CODE: _____ COUNTRY: _____

TELEPHONE: _____ FAX NO: _____ E-MAIL: _____

DATE PURCHASED: _____ MODEL NO: _____ SERIAL NO: _____

PURCHASED FROM: _____

ADDRESS: _____ CITY: _____

STATE: _____ ZIP CODE: _____ COUNTRY: _____

In order for Mylex to better serve your needs, please complete the following:

1. How did you first learn about MYLEX products?

☐ Advertisement (Name of Pub) _____

☐ Article Review ☐ Friend

☐ Retailer _____

☐ Salesperson ☐ Other

2. Where will this product be used?

☐ Home

☐ Workplace

3. What other brands, if any, did you consider? _____

4. Please indicate the most common uses of your system:

☐ Personal

☐ Business

☐ Graphics (CAD/CAM or Business Graphics)

☐ Accounting

☐ Database

☐ Digital Video

☐ Data Retrieval

☐ Multi-User

☐ Multi-Tasking

5. Which factor most influenced your purchase?

☐ Company Reputation

☐ Price

☐ Features (List) _____

☐ Performance

6. What does your computer system include? (Please specify brand and model)

☐ System Unit _____

☐ Peripherals _____

☐ Monitor _____

☐ Operating System _____

7. What add-ons or peripherals are you most considering for future purchase? _____

8. What best describes your occupation?

☐ Management/Administration

☐ Sales/Service

☐ Technical-Scientific/Engineering

☐ MIS

☐ Other _____

9. Do you have any comments or suggestions? _____

10. Have you ever purchased Mylex products in the past?

☐ Yes

☐ No

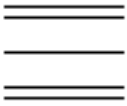
If yes, which products? _____

11. Who purchased this product?

☐ Individual

☐ Company

Place
Postage
Here


mylex

Mylex Corporation
Customer Service Dept.
34551 Ardenwood Blvd.
Fremont, CA 94555-3607

